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JET BURNER OPTIMIZED IN EFFICIENCY

BACKGROUND OF THE INVENTION

The present invention relates to a jet burner, as well as a method for manufacturing the same.

Jet burners for gas have long been known. They are mainly used as radiators, grills or heaters. Usually these known jet burners comprise punched ceramic plates or mats of woven or pressed metal fibers serving as burner surfaces. Gaseous fuels are supplied through a burner pipe and a burner pot by means of a gas nozzle and a Venturi pipe to the burner surface. The gaseous fuels penetrate the burner surface and are burned.

Moreover, for some time so-called "ceramic foam burners" have been known that are manufactured from sponge-like, porous ceramic materials. For example, such so-called "ceramic foam burners" and corresponding jet burner surfaces are manufactured as follows. Sponge-like materials, such as foamed plastics of polyurethane, are soaked with liquid ceramic mass and then are cured in a furnace. Simultaneously, said sponge-like material, i.e. the foamed plastic, burns up and a porous sponge-like ceramic structure remains. This very porous sponge-like material shows an optimum permeability for the fuel gas and is perfectly suited as material for jet burner surfaces. The advantage of these materials is that burners with jet burner surfaces made from so-called ceramic foams have a large output per area, which is clearly superior to the above-described conventional materials, e.g. punched ceramic plates or metal fiber mats. In addition, this material provides excellent technical behavior in terms of exhaust gas technology, namely with respect to the output of disadvantageous carbon monoxides and nitrogen oxides (CO and Nox).

It is, however, a disadvantage in the known jet burners, and jet burner surfaces in particular, that the burner output related to the surface area cannot be regulated sufficiently, especially for use as a cooktop burner. Particularly, ceramic foams produce a high burner output per area. As a result, such jet burners with high burner output per area are not suitable for applications where a comparatively low output is required over a large surface of the burner.

SUMMARY OF THE INVENTION

It is, therefore, the object of the present invention to create a jet burner in which a certain given large surface provides a precise burner output, especially at comparatively low outputs. In addition it is to be manufactured in a simple manner to produce good results in terms of burner technology, exhaust gas technology in particular, and permit regulation in the desired range.

This object is solved by a jet burner according to the present invention, as well as a method for manufacturing a jet burner according to the present invention.

The basic idea of the invention lies in that a generic jet burner is created which, unlike the prior art jet burner that is formed with a uniform surface, is formed with a heterogeneous burner surface. Therein, the burner surface of heterogeneous structure comprises at least two different surface areas, namely a first active surface area permeable for the fuel and a second active surface area impermeable for the fuel. Preferably, the permeable, first active surface area provides a porous surface area so that the gas supplied to the jet burner can stream through said burner surface and be burned. At the second inactive surface area, a preferably larger mass of material, no gas can penetrate and subsequently burn. In this way it is possible the adjust the output related to the entire burner surface in desired manner by the selection of the number or surface area size of the first active surface regions. Providing multiple, uniformly distributed first

active surface regions of small surface are size can help guarantee a uniform distribution of the active regions in the burner surface so that uniform heating over the entire burner surface is possible.

Preferably, the burner surface of the jet burner is embodied such that a plurality of first active surface areas in the form of masses are supported in a second inactive surface area. It, e.g., has proven to be advantageous to choose ceramic foam as first active surface areas, whereas the second surface area is formed by a solid ceramic plate. Of course, it, however, also is possible to construct a jet burner in accordance with the present invention, using other materials for the burner surface, e.g. metal fiber mats or punched ceramics. In this case, the second inactive surface areas, can be formed of a suitable metal, such as high-temperature steels or corresponding suitable alloys, or a ceramic plate. It is also conceivable that different types of material can be mixed, for example, the first active surface areas can be formed of ceramic foam, whereas the second inactive surface area can be formed of metal. However, for technological reasons relating to joining the materials, materials of the same kind are generally used together, i.e. ceramic foams are used with ceramics and metal fiber mats are used with solid metal plates. Beside ceramic foams, of course, metallic foams can be used, as long as they suitably meet the requirements of gas permeability and thermal resistance.

The surface portion of the first active surface area preferably is adjusted in accordance with the desired output. A suitable output range for the use of jet burners for grill and cooking appliances, including glass ceramic cooking sites, is 0.5 to 10 kW, more preferably 1 to 5 kW, and most preferably 1 to 3 kW. A suitable total burner surface for such uses can be provided by a circular burner surface having a diameter of 50 to 300 mm, more preferably 80 to 200 mm, and most preferably 120 mm.

In order to provide uniform heating over the entire burner surface, the first and/or second surface areas can have different sizes and/or shapes and be distributed in the burner surface correspondingly. In particular, uniform, raster-like or star-shaped arrangements with simple circular, strip-shaped, rod-shaped or curved (semi-circular or the like) portions are suitable for this purpose.

A further advantage of the present invention is the simplicity in manufacturing the jet burner and/or a burner surface in accordance with the present invention. A jet burner in accordance with the present invention or a similar burner surface can be manufactured in simple manner, wherein two suitable materials are selected which are connectable with one another in a simple manner. Planar formations having the desired shapes are separately manufactures from each material. Specifically, masses are cut out or machined from a first heat-resistant material, which will be permeable to the fuel after completion. The masses are formed in a shape and size that is complementary to openings formed in the second material, which will be impermeable to the fuel after completion. Then, the fuel-permeable masses are put into said openings of the fuel-impermeable material and bonded together. Thus, a burner surface in accordance with the present invention is manufactured in a simple manner.

This manufacturing method particularly applies to the preferred embodiment of the jet burner, in which said burner surface is formed of a solid ceramic plate in which the masses of foam ceramics are inserted. This kind of jet burner provides advantages of using the best possible material in terms of burning technology, exhaust gas technology in particular, namely foam ceramics, while reducing the high burner output of foam ceramics by arranging masses of foam ceramic in a solid ceramic plate. This arrangement can be produced by gluing prepared masses into a prepared ceramic plate. Alternatively, it is possible to integrate the manufacturing process

for the form ceramics into the manufacturing process for the finished burner surface. Specifically, foamed plastics soaked with liquid ceramic mass, such as polyurethane, are inserted into a ceramic mass or ceramic plate provided with openings, this compound then being fired, whereby said ceramic is cured and the foamed plastic is burned out so that a porous ceramic foam is formed in a uniform ceramic surface.

A further simple possibility for manufacturing a jet burner in accordance with the present invention and/or a corresponding jet burner surface involves making a completely permeable surface, e.g. a porous foam ceramic, partly impermeable by sealing it. In case of a porous foam ceramics, this might be done by applying a liquid ceramic into the areas to be sealed and then firing the ceramic.

Further advantages, characteristics and features of the present invention become evident from the following detailed description of embodiments with reference to the attached drawing.

BRIEF DESCRIPTION OF DRAWINGS

FIGS. 1 to 6 are schematic top views, each showing a different embodiment of a burner surface of a jet burner according to the present invention.

DETAILED DESCRIPTION OF PREFERRED EMBODIMENT

FIG. 1 in shows a top view of a circular burner surface 1 formed out of a circular ceramic plate 2 into which the snake-like porous foam ceramic 3 is imbedded. Said porous foam ceramic 3 provides an active burner portion area of said burner surface 1. The gaseous fuel is supplied through a burner pipe (not shown) and a burner pot by means of a gas nozzle (not shown either) and Venturi pipe, penetrates through said active burner surface and is burned.

Due to the snake-like shape of said foam ceramic 3, an overall large-area burner surface 1 is provided. However, the foam ceramic 3 provides a relatively low burner output surface in comparison to the overall area of the burner surface 1.

A wide variety of variations in the form, the distribution and the portion of the active burner regions, or first surface areas, in said burner surface are possible. The variation of the design is limited only by the desired burner output related to the basic surface of said burner surface and the requirement that uniform heating is given over the entire area of said burner surface 1.

By way of example only, FIGS. 2 to 6 show various additional design possibilities for said burner surface having said active surface areas, or first surface areas 3, and said inactive surface areas, or second surface areas. Corresponding to FIGS. 2 to 6, said active surface areas 3 can be embodied in form of parallel strips, as wedges arranged in star shape, as circular dots, as semicircular arcs or a rods arranged perpendicularly to one another. They all have in common that they permit uniform distribution of said active surface areas 3 in said burner surface 1.

In spite of the fact that, in the shown embodiments of FIGS. 1 to 6, said burner surface 1 is always formed as circular disk, it is also possible, of course, that the said burner surface can take any other suitable shape, e.g. rectangular, square, oval or the like.